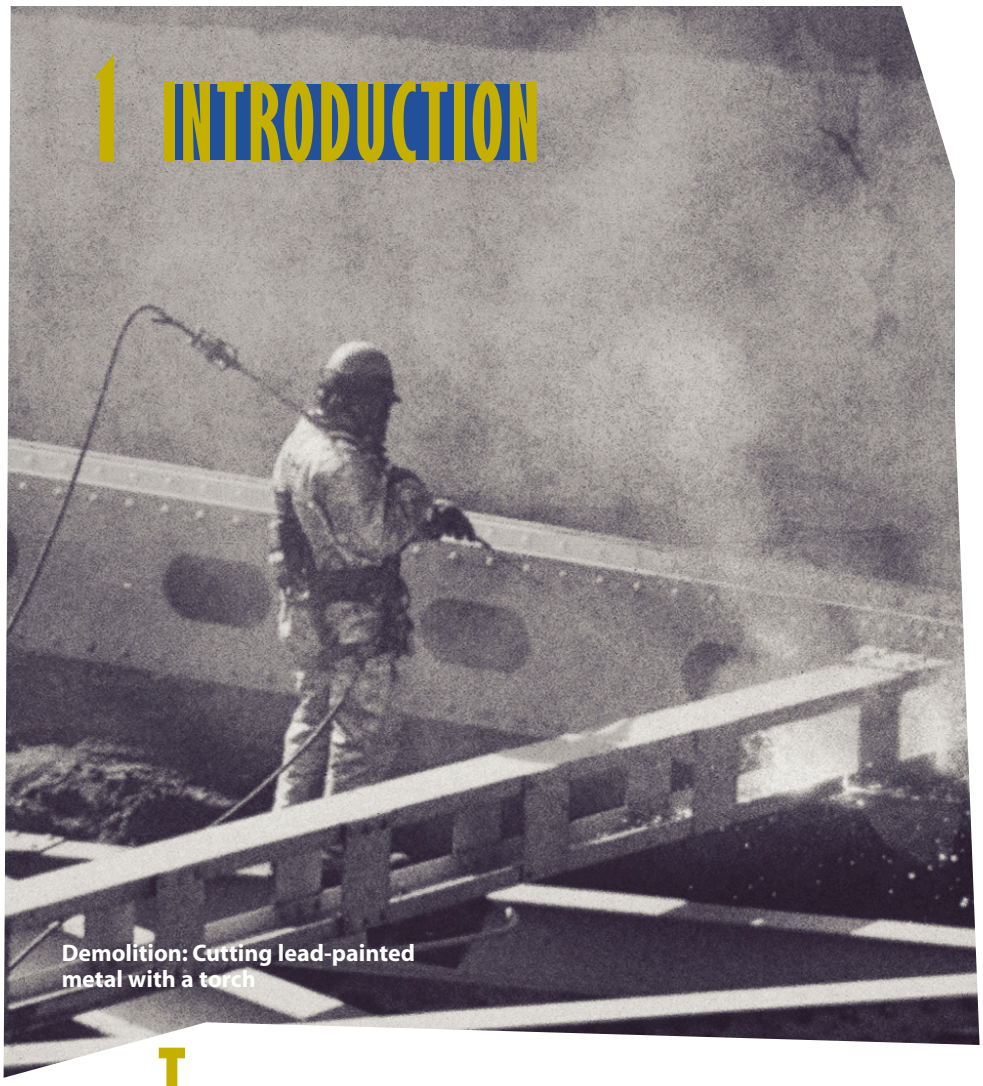
1 INTRODUCTION



Demolition: Cutting lead-painted metal with a torch

The Occupational Lead Poisoning Prevention Program (OLPPP) was established in the CDHS Occupational Health Branch, following the passage of the Occupational Lead Poisoning Prevention Act[1] in 1991. OLPPP is a statewide program aimed at preventing the occurrence of work-related lead poisoning among California workers. OLPPP provides employers with information and technical assistance to control lead exposures; conducts intervention projects in high risk industries; educates workers, employers, and health professionals; investigates severe lead poisoning cases; and maintains the California Occupational Blood Lead Registry.

The California Occupational Blood Lead Registry is a laboratory-based tracking[2] system for lead poisoning that has been in operation since 1987. OLPPP receives, compiles, tabulates, and analyzes the blood lead level (BLL) laboratory reports for adults 16 years and over who are exposed to lead in the workplace. In addition, the Registry also receives and tabulates laboratory reports from non-occupationally exposed adults.

The objectives of the tracking system are threefold: first, to identify serious cases of work-related lead poisoning where follow-up is necessary to ensure proper medical care and control of exposure sources; second, to determine the magnitude and distribution of occupational lead poisoning in California; and third, to provide reliable data for designing and evaluating public health intervention projects in high risk industries.

This report summarizes the Registry findings for the five-year period from January 1, 1995 through December 31, 1999. It also describes the operation of the system, discusses its limitations, and suggests ways to improve tracking of occupational lead poisoning. In addition to lead poisoning, the Occupational Health Branch tracks six other occupational health end points, including asthma, carpal tunnel syndrome, selected fatal and non-fatal injuries, pesticide poisonings, and silicosis.

[1] Health and Safety Code Sections 105185, 105190, 105195.

[2] The term "tracking" is used throughout this report to mean collecting, organizing, and analyzing data about a specific health indicator, in this case blood lead levels. "Tracking" has recently been selected by the Centers for Disease Control and Prevention (CDC) as the preferred term, replacing the earlier term "surveillance."

Background

Exposure to lead has long been known to cause significant health effects in adults, including injury to the nervous system, kidneys, blood-forming, and reproductive systems in men and women.

Damage can occur without any overt signs or symptoms and may be permanent. Exposure to lead can be monitored by measuring the amount of lead in the blood. The results of a BLL test are reported as micrograms of lead per deciliter of whole blood (µg/dl). The BLL reflects the amount of lead currently found in the blood and soft tissues. This may be from recent external exposure as well as from the slow release of any lead stored in bones from past exposures.

There is no known "safe" level of lead in the blood. Recent research continues to show harm to human health at BLLs below 40 µg/dl, including increased blood pressure (Hu, 1996); impaired cognitive abilities, manual dexterity, and muscle strength (Schwartz, 2000; Schwartz, 2001); decreased reaction time (Stollery, 1996); impaired visual-motor coordination (Mantere, 1984); and damaged sperm (Alexander, 1996; Lerda, 1992). In females, lead readily crosses the placenta and is present in breast milk (Abadin, 1997). An elevated risk of spontaneous abortion was found in pregnant women at exposures far lower than encountered in some occupations (Borja-Abuto, 1999).

Lead is associated with harmful effects on children's learning and behavior and the Centers for Disease Control and Prevention (CDC) has established 10 µg/dl as a BLL of concern in children (CDC, 1997). Children under 6 years old as well as the developing fetus are especially sensitive to neurological damage. Impaired cognitive development has been observed in children with prenatal lead exposure (Bellinger, 1987). The persistence of this effect is still uncertain (Bellinger, 1992). Available evidence suggests that there is no BLL without risk of health effects in these populations (National Research Council, 1993). Recent research demonstrated deficits in cognitive and academic skills associated with lead exposure at BLLs lower than 5 µg/dl in children aged 6-16 years (Lanphear, 2000).

Lead has unique chemical and physical properties that have widespread application in general industry and construction. Industries where lead may be found include battery manufacture and recycling; radiator repair; residential, commercial, and industrial painting; firing range operation; nonferrous foundries; and recycling of scrap metal. Lead is encountered in many other industries as well.

Work-related lead poisoning continues to be a serious public health problem. The California Department of Health Services (CDHS) has identified over 100 industries where lead poisoning of workers has been documented. In 1998, the 25 states that required reporting of elevated BLLs to public health officials identified 10,501 adults with BLLs at or above 25 µg/dl (NIOSH, 2000). It is likely that these figures grossly underestimate the extent of work-related lead poisoning in these states. Studies have shown that a low percentage of employers conduct routine blood lead testing of exposed employees (Rudolph, 1990; Papanek, 1992; Nelson, 1998). In the absence of routine BLL testing, many cases of workplace lead poisoning will go undetected.

Occupational Lead Regulations

In 1978, the U.S. Occupational Safety and Health Administration (OSHA) issued a comprehensive standard to protect workers exposed to lead in general industry (29 CFR 1910.1025). In 1993, OSHA issued a similar lead standard for the construction industry (29 CFR 1926.62). California's Division of Occupational Safety and Health (Cal/OSHA) has adopted similar regulations (Title 8 CCR §5198 for general industry; Title 8 CCR §1532.1 for construction). These standards establish airborne exposure limits and require employers to provide exposure assessment and control, training, respiratory protection, hygiene facilities, and a medical surveillance program.

The required medical surveillance[3] program must include periodic blood tests for lead and zinc protoporphyrin (ZPP)[4] for all workers exposed more than 30 days per year at or above an average airborne lead level of 30 micrograms per cubic meter (µg/m^3). Employers must remove an employee from lead exposure when the individual's BLL level is 60 µg/dl or greater;[5] when the individual's average BLL is 50 µg/dl or greater based on three previous BLLs or all BLLs taken in the previous six months, whichever is a longer time period; or when a physician deems it necessary to protect the worker. The employee must remain on medical removal, at a minimum, until two consecutive BLLs are at or below 40 µg/dl. Employers must maintain full earnings, benefits, and seniority of temporarily removed employees. This provision of the standards is called Medical Removal Protection (MRP).

The purpose of the biological monitoring required by the lead standards is to identify individual workers with high exposures; detect early stages of ill health in a worker; ensure that workers at risk receive appropriate medical care and are removed from exposure when warranted; and identify sources of overexposure so that exposure may be reduced.

Using Registry Data for Prevention

While BLL testing can be highly beneficial to an individual worker, it is of little public health value unless the BLL data are systematically collected, organized, and analyzed. The data can then be used to determine the magnitude and distribution of elevated BLLs among lead-exposed workers, and to design and evaluate prevention and control strategies. The Occupational Blood Lead Registry performs all of these public health functions.

[3] As used by OSHA in the lead standards, the term "surveillance" denotes what is better described as medical "screening" because it focuses on direct examination of individual workers for their benefit.

[4] A ZPP test measures a blood constituent used in making red blood cells. It provides an indication of lead exposure in the 3-4 months preceding the test.

[5] The Construction Lead Standard requires removal at 50 µg/dl.